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Publication Date: 14 Nov. 1996

On page(s): 3/1 - 3/6

Number of Pages: 42

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### Abstract

Radio frequency identification (RFID) comprises a base radio transmitter/receiver, or reader, which can interrogate, display, and sometimes rewrite, an electronic code held in a remote device, transponder, and thus identify any item with which the transponder is associated. This paper introduces the ideas of RFID, using TIRIS technology as examples, with particular emphasis on how these principles can be utilised in practical applications

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Pittsburgh, Pennsylvania, United States

Pages: 370 - 377

Year of Publication: 1999

ISBN:0-201-48559-1

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### ↑ ABSTRACT

The role of computers in the modern office has divided our activities between virtual interactions in the realm of the computer and physical interactions with real objects within the traditional office infrastructure. This paper extends previous work that has attempted to bridge this gap, to connect physical objects with virtual representations or computational functionality, via various types of tags. We discuss a variety of scenarios we have implemented using a novel combination of inexpensive, unobtrusive and easy to use RFID tags, tag readers, portable computers and wireless networking. This novel combination demonstrates the utility of invisibly, seamlessly and portably linking physical objects to networked electronic services and actions that are naturally associated with their form.

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## ↑ INDEX TERMS

### **Primary Classification:**

H. Information Systems

↪ H.5 INFORMATION INTERFACES AND PRESENTATION (I.7)

↪ H.5.1 Multimedia Information Systems

↪ Subjects: Artificial, augmented, and virtual realities

**Additional Classification:****H. Information Systems**↳ **H.5 INFORMATION INTERFACES AND PRESENTATION (I.7)**↳ **H.5.3 Group and Organization Interfaces**↳ **Subjects:** Web-based interaction**General Terms:**Design, Theory**Keywords:**RFID tag, augmented reality, phicon, portable computers, tangible interface, ubiquitous computing, wireless networks↑ **Collaborative Colleagues:**

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## TouchTags: using touch to retrieve information stored in a physical object

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Pages: 264 - 265  
Year of Publication: 1999  
ISBN:1-58113-158-5

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### ↑ ABSTRACT

Information can be stored in inexpensive electronic "tag" microchips which can be embedded in physical objects. We have invented a new tag reader technology which allows information to be transferred into or out of these tag microchips through the human body via touch. Our technology has enabled us to create a novel user interface which can recognize when physical icons are touched, and a wearable system that can inventory packages when they are touched.

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## ↑ INDEX TERMS

### Keywords:

physical icons , physical interface , tags , touch , wearables

## ↑ Collaborative Colleagues:

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**1 Privacy/anonymity: The blocker tag: selective blocking of RFID tags for consumer**

Ari Juels, Ronald L. Rivest, Michael Szydlo

October 2003 **Proceedings of the 10th ACM conference on Computer and  
communications security****Publisher:** ACM PressFull text available: [pdf\(223.05 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We propose the use of "selective blocking" by "blocker tags" as a way of protecting consumers from unwanted scanning of RFID tags attached to items they may be carrying or wearing. While an ordinary RFID tag is a simple, cheap (e.g. five-cent) passive device intended as an "electronic bar-code" for use in supply-chain management, a blocker tag is a cheap passive RFID device that can simulate many ordinary RFID tags simultaneously. When carried by a consumer, a blocker tag thus "blocks" RFID reads ...

**Keywords:** RFID tags, barcodes, privacy, tree walking**2 Viewpoint: RFID is x-ray vision**

Frank Stajano

September 2005 **Communications of the ACM**, Volume 48 Issue 9**Publisher:** ACM PressFull text available: [pdf\(71.82 KB\)](#) [html\(13.45 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In a world saturated with RFID tags, protecting the privacy of individuals is technically difficult. Without a proper alignment of interests it may be impossible.

**3 Pointing: ViewPointer: lightweight calibration-free eye tracking for ubiquitous  
handsfree deixis**

John D. Smith, Roel Vertegaal, Changuk Sohn

October 2005 **Proceedings of the 18th annual ACM symposium on User interface  
software and technology UIST '05****Publisher:** ACM PressFull text available: [pdf\(1.55 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We introduce ViewPointer, a wearable eye contact sensor that detects deixis towards ubiquitous computers embedded in real world objects. ViewPointer consists of a small wearable camera no more obtrusive than a common Bluetooth headset. ViewPointer allows any real-world object to be augmented with eye contact sensing capabilities, simply by embedding a small infrared (IR) tag. The headset camera detects when a user is looking at an infrared tag by determining whether the reflection of the tag on ...

**4 Q Focus: RFID: The magic of RFID**

 Roy Want  
October 2004 **Queue**, Volume 2 Issue 7

**Publisher:** ACM Press

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Additional Information: [full citation](#), [index terms](#)



**5 Interaction in the real world: The missing link: augmenting biology laboratory**

 notebooks

Wendy E. Mackay, Guillaume Pothier, Catherine Letondal, Kaare Bøegh, Hans Erik Sørensen  
October 2002 **Proceedings of the 15th annual ACM symposium on User interface software and technology**

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Using a participatory design process, we created three prototype augmented laboratory notebooks that provide the missing link between paper, physical artifacts and on-line data. The final *a-book* combines a graphics tablet and a PDA. The tablet captures writing on the paper notebook and the PDA acts as an "interaction lens" or window between physical and electronic documents. Our approach is document-centered, with a software architecture based on layers of physical and electronic informat ...

**Keywords:** SVG, *a-book*, augmented laboratory note-books, augmented reality, information layers, interaction lens, interactive paper

**6 Staying connected: RFID: is this game of tag fair play?**

 Meg McGinity  
January 2004 **Communications of the ACM**, Volume 47 Issue 1

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Tracking the circuitous tradeoffs of potential consumer benefit versus marketer intrusiveness.

**7 E-commerce-models, structure, mechanisms, globalization, and strategy: The**

 application of RFID on drug safety of inpatient nursing healthcare

Fan Wu, Frank Kuo, Liu-Wei Liu

August 2005 **Proceedings of the 7th international conference on Electronic commerce ICEC '05**

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One of the important issues discussed in World Healthcare Organization (WHO), Europe and America is patient safety. Reducing medical errors is the primary goal to enhance patient safety. The bottleneck of the reduction is that the Hospital Information Systems (HIS) can not track the information about the patient's name, operational time and location immediately and correctly. Under such a situation, it is difficult to integrate the object flow and information flow so as to make systems analysis, ...

**Keywords:** RFID (Radio Frequency Identify Digital), drug safety, inpatient nursing healthcare, medical error, patient safety

8 Poster Session 1: A stacked antenna broad-band RFID front-end for UHF and microwave bands



V. Pillai, H. Heinrich, K. V. S. Rao, R. Martinez

April 2004 **Proceedings of the 14th ACM Great Lakes symposium on VLSI**

**Publisher:** ACM Press

Full text available: [pdf\(202.35 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A stacked antenna front-end for RFIDs is presented. Schottky diode based voltage doubler charge pumps are used on the front-end. The use of schottky diodes permits broadband operation for UHF (915MHz) as well as Microwave (2.45GHz). The entire chip has a low power EEPROM, digital state machine, clock recovery and data demodulation circuits; and the chip implements the ISO 18000-6B protocol for passive UHF (915MHz) operation. The chip is built on n-well, dual poly digital process with schottky di ...

**Keywords:** RFID, UHF, cascade, dual front-end, microwave, passive, schottky, stacked

9 Ubiquitous computing (UC): Extending the EPC network: the potential of RFID in anti- counterfeiting



Thorsten Staake, Frédéric Thiesse, Elgar Fleisch

March 2005 **Proceedings of the 2005 ACM symposium on Applied computing**

**Publisher:** ACM Press

Full text available: [pdf\(106.51 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The International Chamber of Commerce estimates that seven percent of the world trade is in counterfeit goods, with the counterfeit market being worth 500 billion USD in 2004.

Many companies already use overt anti-counterfeiting measures like holograms to confine counterfeiting and product piracy. However, current techniques are not suited for automated tests of product authenticity as required in warehouses, or do not provide the required level of security. In this context, Radio Frequency Iden ...

**Keywords:** RFID, authentication, counterfeiting, track & trace

10 Q Focus: RFID: Integrating RFID



Sanjay Sarma

October 2004 **Queue**, Volume 2 Issue 7

**Publisher:** ACM Press

Full text available: [pdf\(1.09 MB\)](#) [html\(28.58 KB\)](#) Additional Information: [full citation](#), [index terms](#)

11 Security analysis: Strengthening EPC tags against cloning



Ari Juels

September 2005 **Proceedings of the 4th ACM workshop on Wireless security WiSe '05**

**Publisher:** ACM Press

Full text available: [pdf\(142.84 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The EPC (Electronic Product Code) tag is a form of RFID (Radio-Frequency IDentification) device that is emerging as a successor to the printed barcode. Like barcodes, EPC tags emit static codes that serve to identify and track shipping containers and individual objects. EPC tags, though, have a powerful benefit: they communicate in an automated, wireless manner. Some commercial segments, like the pharmaceutical industry, are coming to view EPC tags as a tool to combat counterfeiting. EPC tags are ...

**Keywords:** EPC, RFID, authentication, cloning, counterfeiting, track and trace

12 [Type-based hot swapping of running modules \(extended abstract\)](#) 

 Dominic Duggan

October 2001 **ACM SIGPLAN Notices , Proceedings of the sixth ACM SIGPLAN international conference on Functional programming ICFP '01**, Volume 36 Issue 10

**Publisher:** ACM Press

Full text available:  [pdf\(150.34 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

While dynamic linking has become an integral part of the run-time execution of modern programming languages, there is increasing recognition of the need for support for hot swapping of running modules, particularly in long-lived server applications. The interesting challenge for such a facility is to allow the new module to change the types exported by the original module, while preserving type safety. This paper describes a type-based approach to hot swapping running modules. The approach is bas ...

**Keywords:** dynamic typing, hot swapping, module interconnection languages, shared libraries

13 [Wireless application drivers for low-power systems: Evaluating and optimizing power consumption of anti-collision protocols for applications in RFID systems](#) 

 Feng Zhou, Chunhong Chen, Dawei Jin, Chenling Huang, Hao Min

August 2004 **Proceedings of the 2004 international symposium on Low power electronics and design**

**Publisher:** ACM Press

Full text available:  [pdf\(448.21 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

For low-cost RFID systems, the design of passive tags is a key issue in anti-collision protocols where lower power consumption allows a longer working distance between tags and the reader. In this paper, we look at anti-collision protocols in tags' processing for their power optimization. We propose a new criterion, which takes into account both energy consumption and time complexity, to evaluate anti-collision protocols. An improved protocol is also presented for power savings.

**Keywords:** anti-collision protocols, low power, radio-frequency identification

14 [Smart identification frameworks for ubiquitous computing applications](#) 

Kay Römer, Thomas Schoch, Friedemann Mattern, Thomas Dübendorfer

November 2004 **Wireless Networks**, Volume 10 Issue 6

**Publisher:** Kluwer Academic Publishers

Full text available:  [pdf\(404.91 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We present our results of the conceptual design and the implementation of ubiquitous computing applications using smart identification technologies. First, we describe such technologies and their potential application areas, then give an overview of some of the applications we have developed. Based on the experience we have gained from developing these systems, we point out design concepts that we have found useful for structuring and implementing such applications. Building upon these concep ...

**Keywords:** Jini, RFID tags, ubiquitous computing, virtual counterparts, web services

15 [Physical privacy: Soft blocking: flexible blocker tags on the cheap](#) 

 Ari Juels, John Brainard

October 2004 **Proceedings of the 2004 ACM workshop on Privacy in the electronic society**

**Publisher:** ACM Press

Full text available:  [pdf\(106.34 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

A "blocker" tag is a privacy-enhancing radio-frequency identification (RFID) tag. It operates by interfering with the protocol in which a reader communicates individually with

other RFID tags. While inexpensive to manufacture in quantity, blockers are nonetheless special-purpose devices, and thus introduce level of complexity that may pose an obstacle to their deployment.

We propose a variant on the blocker concept that we call *< i>soft blocking< /i>*. This involves software (or f ...

**Keywords:** ALOHA, RFID tags, blocker tags, privacy, tree-walking

**16 Link and channel measurement: A simple mechanism for capturing and replaying wireless channels**



Glenn Judd, Peter Steenkiste

August 2005 **Proceeding of the 2005 ACM SIGCOMM workshop on Experimental approaches to wireless network design and analysis E-WIND '05**

**Publisher:** ACM Press

Full text available: [pdf\(6.06 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Physical layer wireless network emulation has the potential to be a powerful experimental tool. An important challenge in physical emulation, and traditional simulation, is to accurately model the wireless channel. In this paper we examine the possibility of using on-card signal strength measurements to capture wireless channel traces. A key advantage of this approach is the simplicity and ubiquity with which these measurements can be obtained since virtually all wireless devices provide the req ...

**Keywords:** channel capture, emulation, wireless

**17 RFID: tagging the world: RFID enhances visitors' museum experience at the Exploratorium**



Sherry Hsi, Holly Fait

September 2005 **Communications of the ACM**, Volume 48 Issue 9

**Publisher:** ACM Press

Full text available: [pdf\(700.03 KB\)](#) [html\(22.68 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Interactive RFID-enhanced museum exhibits let visitors continue their scientific exploration beyond the museum's walls. But museums must still help them understand the technology and address their data privacy concerns.

**18 RFID: tagging the world: Introduction**



Gaetano Borriello

September 2005 **Communications of the ACM**, Volume 48 Issue 9

**Publisher:** ACM Press

Full text available: [pdf\(61.16 KB\)](#) [html\(13.98 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Cheap, tiny, plentiful radio-frequency identification tags will make it possible to tag almost everything, spurring a revolution in how physical objects interact with information services.

**19 Late-breaking results: MIT is the limit: TouchTags: using touch to retrieve information stored in a physical object**



Benjamin Vigoda, Neil Gershenfeld

May 1999 **CHI '99 extended abstracts on Human factors in computing systems**

**Publisher:** ACM Press

Full text available: [pdf\(222.36 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Information can be stored in inexpensive electronic "tag" microchips which can be embedded in physical objects. We have invented a new tag reader technology which allows information to be transferred into or out of these tag microchips through the

human body via touch. Our technology has enabled us to create a novel user interface which can recognize when physical icons are touched, and a wearable system that can inventory packages when they are touched.

**Keywords:** physical icons, physical interface, tags, touch, wearables

20 StarLite, a visual simulation package for software prototyping



 Robert P Cook, Rihard J Auletta

January 1987 **ACM SIGPLAN Notices , Proceedings of the second ACM SIGSOFT/SIGPLAN software engineering symposium on Practical software development environments SDE 2**, Volume 22 Issue 1

Publisher: ACM Press

Full text available:  [pdf\(1.01 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We describe a software prototyping environment implemented on the Lilith computer. By isolating hardware dependencies, the environment supports the development and testing of concurrent and distributed algorithms on a host as well as on the target hardware. A library of generic devices, which includes clocks, disks and EtherNets, is provided to support experimentation. The paper describes how any programming language can be extended to provide such an environment by adding subroutine packag ...

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**1** [CAT—caching address tags: a technique for reducing area cost of on-chip caches](#) 

 Hong Wang, Tong Sun, Qing Yang

May 1995 **ACM SIGARCH Computer Architecture News , Proceedings of the 22nd annual international symposium on Computer architecture ISCA '95**, Volume 23 Issue 2

**Publisher:** ACM Press

Full text available:  [pdf\(1.36 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper presents a technique for minimizing chip-area cost of implementing an on-chip cache memory of microprocessors. The main idea of the technique *Caching Address Tags*, or *CAT cache* for short. The *CAT* cache exploits locality property that exists among addresses of memory references for the purpose of minimizing chip area-cost of address tags. By keeping only a limited number of distinct tags of cached data rather than having as many tags as cache lines, the *CAT* ...

**2** [Rich and lean representations of information for knowledge work: the role of computing packages in the work of classical scholars](#) 

 Karen Ruhleder

April 1994 **ACM Transactions on Information Systems (TOIS)**, Volume 12 Issue 2

**Publisher:** ACM Press

Full text available:  [pdf\(1.83 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Applying information systems to complex intellectual tasks requires the representation and codification of ambiguous and fragmentary forms of data. This application effects changes not only in representation of this data, but in the relationships between users and tools, techniques, or systems for data interpretation. It also affects the complex infrastructures that support this process. This article uses a package metaphor to examine the impact on one domain of knowledge w ...

**Keywords:** computerization of knowledge work, computing packages, decontextualization of information, information representations, locus of expertise

**3** [Bridging physical and virtual worlds with electronic tags](#) 

 Roy Want, Kenneth P. Fishkin, Anuj Gujar, Beverly L. Harrison

May 1999 **Proceedings of the SIGCHI conference on Human factors in computing systems: the CHI is the limit**

**Publisher:** ACM Press

Full text available:  [pdf\(1.45 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The role of computers in the modern office has divided our activities between virtual

interactions in the realm of the computer and physical interactions with real objects within the traditional office infrastructure. This paper extends previous work that has attempted to bridge this gap, to connect physical objects with virtual representations or computational functionality, via various types of tags. We discuss a variety of scenarios we have implemented using a novel combination of ...

**Keywords:** RFID tag, augmented reality, phicon, portable computers, tangible interface, ubiquitous computing, wireless networks

4 Design technologies: Reading source code 

Darrell R. Raymond

October 1991 **Proceedings of the 1991 conference of the Centre for Advanced Studies on Collaborative research**

**Publisher:** IBM Press

Full text available:  [pdf\(988.89 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Source code is, among other things, a text to be read. In this paper I argue that reading source code is a key activity in software maintenance, and that we can profitably apply experiences and reading systems from text databases to the problem of reading source code. Three prototype systems are presented, and the main features of their design are discussed.

5 Meme tags and community mirrors: moving from conferences to collaboration 

 Richard Borovoy, Fred Martin, Sunil Vemuri, Mitchel Resnick, Brian Silverman, Chris Hancock November 1998 **Proceedings of the 1998 ACM conference on Computer supported cooperative work**

**Publisher:** ACM Press

Full text available:  [pdf\(1.10 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** collaboration, community, groupware, infrared communication, interaction design, meme, name tag, wearable computing

6 Document Formatting Systems: Survey, Concepts, and Issues 

 Richard Furuta, Jeffrey Scofield, Alan Shaw September 1982 **ACM Computing Surveys (CSUR)**, Volume 14 Issue 3

**Publisher:** ACM Press

Full text available:  [pdf\(5.36 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

7 Cache design with path balancing table, skewing and indirect tags 

 Tommi Jokinen, Chia-Jiu Wang June 1997 **ACM SIGARCH Computer Architecture News**, Volume 25 Issue 3

**Publisher:** ACM Press

Full text available:  [pdf\(602.59 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

A cache design aimed to reduce cycle time, area, and miss rate simultaneously is proposed in this paper. A cache with path balancing table, skewing, and indirect tags can reduce cycle time, use less area, and reduce miss rate at the same time as compared with a baseline cache. From our simulation results, we propose cache design alternatives in achieving lower cycle time, lower miss rate, and using less area.

8 Late-breaking results: new metaphors for user interfaces: Swept-frequency, 

 magnetically-coupled resonant tags for realtime, continuous, multiparameter control

Joseph Paradiso, Kai Yuh Hsiao

May 1999 **CHI '99 extended abstracts on Human factors in computing systems**

**Publisher:** ACM Press

We have developed a passive tag reader optimized for applications in human-computer interaction. It sweeps through a 50-300 kHz read frequency, flagging any magnetically-coupled resonators in that range. It is a minimally-complicated circuit, and is able to provide the center frequency, resonance width, and amplitude for each detected tag over a serial line at 30 Hz continuous updates. The tags are easily fashioned, consisting only of an inductor and capacitor or magnetostrictor tag cut to appro ...

**Keywords:** RFID, finger tracking, musical interfaces, passive tags, proximity sensing, wireless sensing

**9 Ada 9X tagged types and their implementation in GNAT** 

 Cyrille Comar, Brett Porter  
November 1994 **Proceedings of the conference on TRI-Ada '94**

**Publisher:** ACM Press

Full text available:  pdf(1.08 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

**10 Inexpensive implementations of set-associativity** 

 R. E. Kessler, R. Jooss, A. Lebeck, M. D. Hill  
April 1989 **ACM SIGARCH Computer Architecture News , Proceedings of the 16th annual international symposium on Computer architecture ISCA '89**, Volume 17 Issue 3

**Publisher:** ACM Press

Full text available:  pdf(1.16 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The traditional approach to implementing wide set-associativity is expensive, requiring a wide tag memory (directory) and many comparators. Here we examine alternative implementations of associativity that use hardware similar to that used to implement a direct-mapped cache. One approach scans tags serially from most-recently used to least-recently used. Another uses a partial compare of a few bits from each tag to reduce the number of tags that must be examined serially. The drawback of bo ...

**11 Software protection and simulation on oblivious RAMs** 

 Oded Goldreich, Rafail Ostrovsky  
May 1996 **Journal of the ACM (JACM)**, Volume 43 Issue 3

**Publisher:** ACM Press

Full text available:  pdf(3.44 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Software protection is one of the most important issues concerning computer practice. There exist many heuristics and ad-hoc methods for protection, but the problem as a whole has not received the theoretical treatment it deserves. In this paper, we provide theoretical treatment of software protection. We reduce the problem of software protection to the problem of efficient simulation on oblivious RAM. A machine is oblivious if the sequence in wh ...

**Keywords:** pseudorandom functions, simulation of random access machines, software protection

**12 Tags and type checking in LISP: hardware and software approaches** 

 Peter Steenkiste, John Hennessy  
October 1987 **ACM SIGPLAN Notices , ACM SIGOPS Operating Systems Review , ACM SIGARCH Computer Architecture News , Proceedings of the second international conference on Architectural support for programming languages and operating systems ASPLOS-II**, Volume 22 , 21 , 15 Issue 10 , 4 , 5

**Publisher:** IEEE Computer Society Press, ACM Press

Additional Information:

One of the major factors that distinguishes LISP from many other languages (Pascal, C, Fortran, etc.) is the need for run-time type checking. Run-time type checking is implemented by adding to each data object a tag that encodes type information. Tags must be compared for type compatibility, removed when using the data, and inserted when new data items are created. This tag manipulation, together with other work related to dynamic type checking and generic operations, constitutes a significant c ...

13 [TAGS](#)

 Miguel Carrio  
July 1989 **Proceedings of the conference on TRI-Ada '88**

**Publisher:** ACM Press

Full text available:  pdf(437.84 KB)

Additional Information: [full citation](#), [references](#), [index terms](#)



14 [Late-breaking results: MIT is the limit: TouchTags: using touch to retrieve information stored in a physical object](#)

 Benjamin Vigoda, Neil Gershenfeld  
May 1999 **CHI '99 extended abstracts on Human factors in computing systems**

**Publisher:** ACM Press

Full text available:  pdf(222.36 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Information can be stored in inexpensive electronic "tag" microchips which can be embedded in physical objects. We have invented a new tag reader technology which allows information to be transferred into or out of these tag microchips through the human body via touch. Our technology has enabled us to create a novel user interface which can recognize when physical icons are touched, and a wearable system that can inventory packages when they are touched.

**Keywords:** physical icons, physical interface, tags, touch, wearables



15 [PELLPACK: a problem-solving environment for PDE-based applications on multicomputer platforms](#)

 E. N. Houstis, J. R. Rice, S. Weerawarana, A. C. Catlin, P. Papachiou, K.-Y. Wang, M. Gaitatzes

March 1998 **ACM Transactions on Mathematical Software (TOMS)**, Volume 24 Issue 1

**Publisher:** ACM Press

Full text available:  pdf(26.30 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)



The article presents the software architecture and implementation of the problem-solving environment (PSE) PELLPACK for modeling physical objects described by partial differential equations (PDEs). The scope of this PSE is broad, as PELLPACK incorporates many PDE solving systems, and some of these, in turn, include several specific PDE solving methods. Its coverage for 1D, 2D. and 3D elliptic or parabolic problems is quite broad, and it handles some hyperbolic problems, Since a PSE should p ...

**Keywords:** PDE language, execution models, knowledge bases, libraries, parallel reuse methodologies, problem-solving environments, programming-in-the-large, sofeware bus

16 [Algorithm 755: ADOL-C: a package for the automatic differentiation of algorithms written in C/C++](#)

 Andreas Griewank, David Juedes, Jean Utke

June 1996 **ACM Transactions on Mathematical Software (TOMS)**, Volume 22 Issue 2

**Publisher:** ACM Press

Additional Information:



The C++ package ADOL-C described here facilitates the evaluation of first and higher derivatives of vector functions that are defined by computer programs written in C or C++. The resulting derivative evaluation routines may be called from C/C++, Fortran, or any other language that can be linked with C. The numerical values of derivative vectors are obtained free of truncation errors at a small multiple of the run-time and randomly accessed memory of the given function evaluation program. D ...

**Keywords:** Hessians, Taylor coefficients, automatic differentiation, chain rule, forward mode, gradients, overloading, reverse mode

**17** Fast dispatch mechanisms for stock hardware 

 John R. Rose

January 1988 **ACM SIGPLAN Notices , Conference proceedings on Object-oriented programming systems, languages and applications OOPSLA '88**, Volume 23 Issue 11

**Publisher:** ACM Press

Full text available:  pdf(1.16 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**18** The performance analysis workstation: an interactive animated simulation package for queueing networks 

B. Melamed

November 1986 **Proceedings of 1986 ACM Fall joint computer conference**

**Publisher:** IEEE Computer Society Press

Full text available:  pdf(1.28 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**19** Writing Man Pages in HTML 

Michael Hamilton

March 1997 **Linux Journal**

**Publisher:** Specialized Systems Consultants, Inc.

Full text available:  html(29.94 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**20** Interactive Editing Systems: Part II 

 Norman Meyrowitz, Andries van Dam

September 1982 **ACM Computing Surveys (CSUR)**, Volume 14 Issue 3

**Publisher:** ACM Press

Full text available:  pdf(9.17 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

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